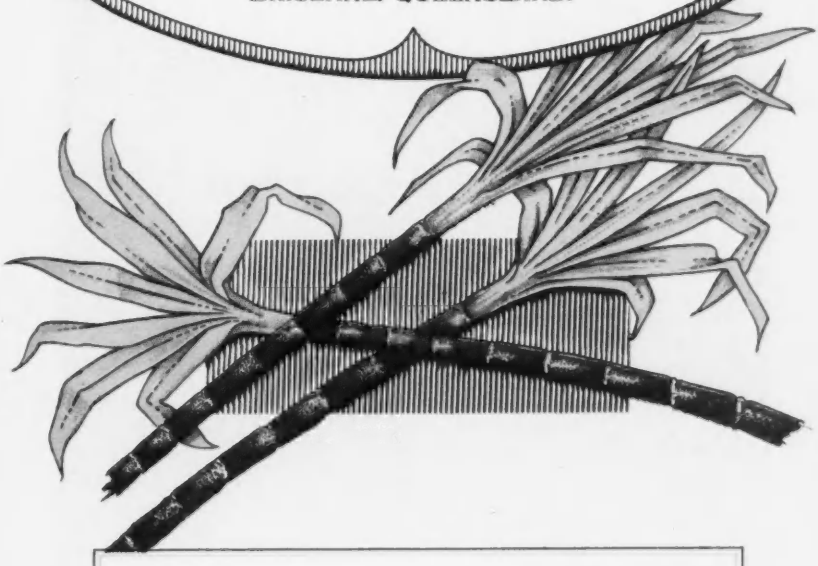
DEPARTMENT OF AGRICULTURE AND STOCK.

The CANE GROWERS' QUARTERLY BULLETIN

ISSUED BY
BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE, QUEENSLAND.



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1938 Season.

BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE

THE
CANE GROWERS'
QUARTERLY BULLETIN

ISSUED BY DIRECTION OF THE
HON. F. W. BULCOCK, MINISTER
FOR AGRICULTURE AND STOCK

1 JANUARY, 1939

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The
Cane Growers' Quarterly
—Bulletin—

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Farm Fertility Trials.

Results of the 1938 Season.

THE results of the farm fertility trials presented at this time represent the ninth of the series since the project was initiated. These trials have doubtless provided farmers with a wealth of information, which they have freely applied in the more intelligent use of the correct fertilizer mixtures for their lands. They now recognise that the use of these materials in judicious amounts carries a twofold benefit—(1) it reduces costs of production by allowing larger crops to be produced per acre of land cultivated; and (2) it helps maintain or even builds up the fertility of the land, which, in many instances, has become depleted due to years of cropping. It is not an exaggeration to state that, but for the wisdom of such a policy, many growers would be unable to carry on with the reduced prices they are now receiving for their commodity.

A review of the results presented in the following pages of this Bulletin will convince growers of the wide variation which exists in the plantfood requirements of soils of diverse origin, under varying climatic conditions. Though it certainly "pays to fertilize," there is no *best* mixture which will suit all conditions; each set of circumstances must be treated according to the results of actual field trial, and it is the aim of the Bureau to supply this advice from the results of farm fertility experiments.

We have explained in previous Bulletins that all mixtures used in our farm trials are compounded from the three constituents—sulphate of ammonia, superphosphate, and muriate of potash. Suitable weights of these are put together in pairs, or all three together, and from the yield results obtained we can tell which of the individual plantfood materials has been instrumental in bringing about crop increases. It will be noticed that our trials are of two kinds—(*a*) those which tell us the kind of plantfood most seriously lacking, and (*b*) those which aim to provide information regarding the *amounts* of the several materials which should give the most profitable returns.

We do not recommend that farmers purchase the precise materials we have used in our experiments. It is usually more satisfactory for them to purchase suitable mixed manures from reputable fertilizer distributing firms; we have devised special mixtures for cane growers, and all our recommendations are based on the use of these fertilizers exclusively. These are Sugar Bureau Mixtures Nos. 1, 2, and 3, a Planting and a Ratooning formula being supplied for each number. When a farmer learns, for example, that his soil is highly deficient in potash, he will require No. 3 mixtures, and he should use the No. 3 Planting Mixture for plant cane, and the No. 3 Ratooning Mixture for ratoons. Similarly, soils highly deficient in phosphate require No. 1 mixtures.

It should be clearly observed that these mixtures contain very little nitrogen, and it is important that sulphate of ammonia be employed in addition, to correct any deficiency which the soil exhibits in respect of this plantfood. It is well to recognise that the practice of fertilizing cane is best performed as a two-part process: the inital application to give the crop what it needs in additional phosphate and potash, and to supply the nitrogen as top dressings with sulphate of ammonia, when the root system is established.

Values used in Calculations.

In computing the financial returns for the trials, a raw sugar value of £17 per ton has been assumed. This should approximate fairly closely to the value of No. 1 Pool sugar. Fertilizer prices are based on current quotations, and due allowance has been made for freight charges to the main sugar centres. A further allowance of 10s. per acre has been made for costs of handling and application, except in the case where only drill applications are made, when the allowance has been reduced to 5s.

Acknowledgement.

The farm fertility trial project has been made possible at no cost to the Bureau for the fertilizer employed, through the generous co-operations of the following firms:—

Messrs. A.C.F. and Shirley's Fertilizers Ltd.,

Pacific Potash Ltd.

The Director wishes to record his appreciation of this valued assistance.

We wish also to express appreciation of the assistance rendered by mill staff officers, in the harvesting of trials and testing of cane samples, and of the kindly co-operation of those canegrowers on whose farms the trials were located.

NORTHERN DISTRICTS.

During 1938, seven farm fertility trials were harvested in the areas from Mossman to Tully. This number was substantially below normal, but was due to the larger volume of varietal trial work which our Instructors were called upon to perform during the year.

Growing conditions were distinctly unfavourable in the Cairns-Mossman areas, while in the Tully-Babinda districts a severe spring check was followed by a generally satisfactory wet season. That consistently beneficial results from the use of the correct fertilizers are to be obtained in the high rainfall belt, is demonstrated by the following figures for average yields, in which the fully-fertilized and unmanured plots are taken:—

	Tons.
Average "Complete manure" plots	24·6
Average "No manure" plots	16·4
Average gain due to manure	**8·2**

A study of the individual trials will also make it clearly evident that failure to recognise the essentially deficient character of these soils soon leads to impoverished yields, and profitable crops may be harvested only where the correct manures are applied to all crops in correct proportions.

Once again we would emphasise that growers should study carefully only those results from trials which have been conducted on soil types similar to their own. Conclusions for other trials, no matter how attractive the results may appear, may be entirely misleading.

Ives Bros.' Farm, Miallo, Mossman.

Soil Type.—Dark grey forest loam (outwash).

Variety.—S.J. 4.

Nature of Crop.—First Ratoon.

Age of Crop.—11 months.

RESULTS.

Fertiliser Applied per Acre.			Crop Yields.		Cost of Fertiliser and Application.	Net Return (per acre) from Fertiliser.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	16·0	15·4	..	..	..
360	270	..	21·8	14·5	3 5 0	2 4 0	..
360	..	180	20·6	15·3	3 14 0	2 15 0	..
..	270	180	18·5	15·6	2 1 0	2 4 0	..
360	270	180	26·5	14·6	4 8 0	7 14 0	..

DISCUSSION.

The plant crop from this trial was harvested in 1937, and showed a highly satisfactory gain from fertilizer. The fully-manured plots yielded 12 tons of cane per acre more than the unmanured plots. Although the ratoons were grown under distinctly unfavourable conditions, the yield was again satisfactory, and the overall gain from manure was 10·5 tons of cane per acre.

It is of interest to record the relative gains due to the individual plantfood constituents:—

Crop Increase due to—	Plant Cane.	First Ratoons.
	Tons.	Tons.
Sulphate of ammonia	4·9	8·0
Superphosphate	5·9	5·9
Muriate of potash	5·3	4·7

There is a general similarity in these figures, excepting that sulphate of ammonia showed rather a dominating influence with ratoons. This is in accordance with the usual experience that sulphate of ammonia is of particular value on such crops.

We have here ample evidence that this soil has been neglected and depleted of its plantfood reserves. The use of Sugar Bureau No. 2 mixtures, at the rate of 4 cwt. per acre, is recommended for plant and

ratoon crops. Top dressings of sulphate of ammonia will also be necessary; plant cane would profit from 2 bags of this material per acre, while ratoons might utilize 2½ bags very profitably. Obviously, green manuring must be regarded as an essential treatment for such land while in fallow.

Vessey and Son's Farm, Edge Hill, Cairns.

Soil Type.—Schist loam (outwash).

Nature of Crop.—Second Ratoon.

Variety.—S.J. 4.

Age of Crop.—12 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per Acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	6·1	16·1	..	..	..
360	270	..	18·5	17·4	3 5 0	14 12 0	..
360	..	180	18·5	16·2	3 14 0	10 17 0	..
..	270	180	6·2	16·4	2 1 0	..	1 12 0
360	270	180	20·2	16·8	4 8 0	14 13 0	..

DISCUSSION.

The block in which this trial was located early exhibited its marked deficiency in available nitrogen, and the three crops harvested therefrom have given unusually heavy responses to applications of sulphate of ammonia. These effects are illustrated by a summary of the crop increases due to the three individual plant-food materials used in compounding the fertilizers applied:—

Crop Increase due to—	Plant Cane.	First Ratoon.	Second Ratoon.
	Tons.	Tons.	Tons.
Sulphate of ammonia	2·5	18·0	14·0
Superphosphate	3·6	0·6	1·7
Muriate of potash	3·5	3·0	1·7

It is quite evident that failure to apply sulphate of ammonia to ratoons on this land leads to a complete failure of the crop. The plant cane, which gave a heavy yield (48 tons per acre), showed but slight benefits from the sulphate of ammonia top dressings, due to the fact that a good green manure crop had been ploughed under prior to planting the cane. Two facts are clearly evident from these results: (1) Green manuring assures a good supply of available nitrogen for plant cane, and (2) the beneficial effects of this treatment must have virtually disappeared with the harvesting of the plant cane, and artificial manures are required to supply the ratoon crops.

On this land, Sugar Bureau No. 2 mixtures are recommended, applied at the rate of 3-4 cwt. per acre, and followed by top dressings of ammonia, notably with ratoons, which should receive 3-4 cwt. of this manure per acre.

L. S. Christensen's Farm, Edmonton.

Soil Type.—Red schist (with stony areas).

Variety.—S.J. 4.

Nature of Crop.—First Ratoon.

Age of Crop.—12 months.

RESULTS.

Fertiliser Applied per Acre.			Crop Yields.		Cost of Fertiliser and Application.	Net Return (per acre) from Fertiliser.	
Sulphate of Ammonia. (N)	Super-phosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	25·0	16·3	..	..	..
360	360	..	27·0	15·8	3 10 0	..	2 9 0
360	..	210	29·5	15·7	3 18 0	0 10 0	..
..	360	210	26·5	15·9	2 9 0	..	1 14 0
360	360	210	29·8	15·3	4 16 0	..	1 14 0

DISCUSSION.

This trial is particularly interesting as it demonstrates what has been emphasised on frequent occasions; that although the land may be able to supply the plant crop of cane with its full plant-food requirements, these will need supplementing with ratoons.

The plant crop yielded nearly 47 tons per acre, with little benefit from the manurial treatment. But the ratoon crop—which was adversely affected by dry conditions—showed a crop increase of nearly 5 tons per acre due to the manure applied. As is customary on soil of this type, sulphate of ammonia was of outstanding value, but the

crop gain due to potash was also not insignificant. That no profit was shown from the fertilizer applied was due to the harvesting of the crop before the fertilized cane was mature.

Sugar Bureau No. 2 mixtures are recommended for use on this soil type, applied at the rate of 3-4 cwt. per acre for all crops. Top dressings of sulphate of ammonia should follow; the quantity to be applied profitably to plant cane will be governed by the nature of the preceding fallow—whether bare or under legumes—but ratoons will profit from at least 2 bags of sulphate of ammonia per acre, applied in two equal dressings.

Fox and Co.'s Farm, Highleigh, Gordonvale.

Soil Type.—Alluvial loam. **Nature of Crop.**—First Ratoon.
Variety.—Badila. **Age of Crop.**—12 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Extra Fertilizer over N.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
360	..	..	19·7	18·0	2 7 0	..	..
360	180	180	23·8	17·4	4 3 0	3 11 0	..
360	180	360	24·5	17·7	5 6 0	4 17 0	..
360	360	180	21·7	17·7	4 12 0	0 10 0	..
360	360	360	22·7	18·0	5 15 0	2 3 0	..

DISCUSSION.

This trial marks an attempt to determine whether superphosphate or muriate of potash are likely to produce crop increases on good-quality alluvial soil. As all plots were given sulphate of ammonia treatment, no evidence is available regarding this important plant-food material.

The plant crop yielded over 41 tons of Badila per acre, but the ratoon yield was disappointing, due to the decidedly unfavourable conditions under which the crop was produced. Although there appears to be some gain from the use of extra potash, the results are not significant and no conclusions may be drawn from the trial.

We would, therefore, repeat our general recommendations for the alluvial soils of North Queensland:—(1) Liming if tests show that the soil is highly acid and in need of this treatment; (2) drill application

of Sugar Bureau No. 1 planting mixture, at the rate of 3-5 cwt. per acre; (3) no further fertilizer treatment if a green manure crop has just been ploughed under; otherwise sulphate of ammonia top dressings will be necessary, at the rate of 1½-2 bags per acre. *All* ratoon crops will require sulphate of ammonia dressings, at the rate of 2 bags per acre, in addition to an initial application of Sugar Bureau No. 1 Ratooning mixture, applied early in the lifetime of the ratoon crop.

J. McCutcheon's Farm, Liverpool Ck., Innisfail.

Soil Type.—Alluvial loam. **Nature of Crop.**—Third Ratoon.

Variety.—Badila. **Age of Crop.**—9 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields		Cost of Fertilizer and Application.	Net Return (per acre) from extra Fertilizer over K.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	160	17·1	12·0	1 5 0	..	..
240	240	160	19·5	13.8	3 10 0	5 8 0	..
240	480	160	20·7	13·0	4 1 0	3 16 0	..
480	240	160	20·0	13·3	4 17 0	3 3 0	..
480	480	160	21·9	13.4	5 9 0	5 0 0	..

DISCUSSION.

This trial has now been conducted on the same site for a period of four years. All plots were treated uniformly with a light application of muriate of potash, while the amounts of sulphate of ammonia and superphosphate were varied with different series of plots. Substantial overall gains due to the fertilizer applications were recorded annually, though in no case was the increase due to the *double* over the *single* dressing of superphosphate outstanding. The gains due to sulphate of ammonia, however, suggested that 240 lb. of this manure per acre was not sufficient for maximum ratoon yields, and probably 3 cwt. per acre would be the best treatment.

The general recommendations for alluvial soils (see p. 99) are applicable to these lands.

V. Cataldo's Farm, Mourilyan.

Soil Type.—Red loam (mixed origin).

Nature of Crop.—First Ratoon.

Variety.—Badila.

Age of Crop.—11 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Extra Fertilizer over N.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
270	..	..	12·5	14·7	1 17 0	..	..
270	180	180	18·4	15·0	3 13 0	7 14 0	..
270	180	360	20·2	15·2	4 16 0	9 14 0	..
270	360	180	18·7	14·8	4 2 0	7 1 0	..
270	360	360	21·7	14·7	5 5 0	9 13 0	..

DISCUSSION.

All plots in this trial were top dressed uniformly with sulphate of ammonia, and in addition various superphosphate and potash applications were made. Both plant and ratoon crops have shown the absolute necessity for suitable mixed fertilizer on land of this character; the crop gains for the *double* over the *single* applications of superphosphate and potash were:—

Crop Increase Due to—	Plant Cane.	First Ratoon.
	Tons.	Tons.
2 P over 1 P	2·8	0·9
2 K over 1 K	1·9	2·4

These gains are over and above the crop increases brought about by the initial phosphate and potash applications. The overall gain for the heaviest fertilizer treatment was 9·2 tons of cane per acre, and a partial crop failure was converted to a reasonable ratoon crop.

Sugar Bureau No. 2 mixtures are advised for this class of soil; they should be applied to all cane crops at the rate of 5 cwt. per acre. Sulphate of ammonia top dressings will also be required, at the rate of 1½-2 bags per acre for plant cane and 2 bags per acre for ratoons.

J. P. Kelleher's Farm, Tully.

Soil Type.—Alluvial clay loam. **Nature of Crop.**—Second Ratoon.

Variety.—Badila. **Age of Crop.**—14 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	18·3	16·6	..	..	..
360	360	..	26·2	16·0	3 9 0	7 3 0	..
360	..	180	20·6	16·4	3 14 0	..	12 0
..	360	180	23·5	16·4	2 5 0	5 11 0	..
360	360	180	27·7	16·1	4 12 0	8 14 0	..

DISCUSSION.

Three crops have been harvested from this trial site, and the gains from manure have been highly satisfactory each year. The gains due to the individual plantfood materials were:—

Crop Increase Due to—	Plant Cane.	First Ratoon.	Second Ratoon.
	Tons.	Tons.	Tons.
Sulphate of ammonia	3·2	4·9	4·2
Superphosphate	4·8	2·3	7·1
Muriate of potash	1·2	0·9	1·5

This soil exhibits all the characteristics of the "typical" acid alluvial of North Queensland; it requires liming, exhibits a very definite phosphate deficiency, while the potash supply is reasonably good, and responds to sulphate of ammonia top dressings.

Again Sugar Bureau No. 1 mixtures are advocated for use on soils of this type. These should be followed by top dressings of sulphate of ammonia—1½-2 bags per acre for plant cane, and 2 bags per acre for ratoons. The application of artificial nitrogenous manure to plant cane will be governed by the nature of the preceding fallow, and where a heavy crop of legumes has been ploughed under and rotted just prior to planting the cane, may even be omitted without any loss in cane crop.

BURDEKIN DISTRICT.

Only two trials were conducted in the Burdekin district during the past year, due to the interruption in the extension service consequent upon the resignation of the local Instructor in Cane Culture. Each trial was carried out with ratoon cane, and neither crop gave a highly satisfactory yield. But the values recorded are consistent with all experiments conducted in the area, in that they demonstrated the absolute need for substantial applications of sulphate of ammonia, if successful ratoon crops are to be harvested. The average of the two trials were:—

	Tons Cane.
90 lb. sulphate of ammonia	13·1
180 lb. „ „ „	14·6
270 lb. „ „ „	17·7
360 lb. „ „ „	20·5
450 lb. „ „ „	22·2

It will be observed that consistent gains were obtained for successive increments of this fertilizer material; and it would appear that the heaviest application (4 cwt. per acre) was not excessive on soils of this type, with ratoon crops.

Our general recommendation with the Burdekin alluvial loams is as follows:—A light dressing of Sugar Bureau No. 1 planting mixture should be placed in the drill with the plants, followed by a top dressing of sulphate of ammonia (1 bag per acre) in the spring. A similar top dressing should be made a few weeks later. Ratoons should be given an initial light application of mixed manure, followed by three dressings of sulphate of ammonia, each of 1 bag per acre, at monthly intervals.

J. Ahern's Farm, Airedale, Ayr.

Soil Type.—Alluvial loam. **Nature of Crop.**—First Ratoon.
Variety.—Badila. **Age of Crop.**—11 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Extra Fertilizer over 1N.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
90	**240**	**120**	**12·9**	16·8	2 6 0	..	..
180	**240**	**120**	**15·0**	16·5	2 17 0	**3 4 0**	..
270	**240**	**120**	**19·0**	16·5	3 7 0	**9 4 0**	..
360	**240**	**120**	**21·2**	16·5	3 18 0	**12 5 0**	..
450	**240**	**120**	**23·7**	16·3	4 8 0	**15 2 0**	..

DISCUSSION.

Certain series of plots in the plant crop harvested from this site yielded over 60 tons of cane per acre, but definite crop increases were recorded with applications of sulphate of ammonia up to 270 lb. per acre.

The ratoon crop shows a very substantial decline in yield, but it is interesting to note that very definite crop gains may be traced even to the heaviest application of sulphate of ammonia (4 cwt. per acre). The crop increase for this treatment over the cane which received only 90 lb. per acre was 10·8 tons, and it may be assumed that with no sulphate of ammonia the ratoons would have been a complete failure.

It would appear, on the basis of these results, that applications of sulphate of ammonia, even in excess of 4 cwt. per acre, may prove profitable with ratoons on certain of the Burdekin alluvial soils.

J. Stockdale's Farm, Down River, Home Hill.

Soil Type.—Alluvial loam.
Variety.—Badila.
Nature of Crop.—First Ratoon.
Age of Crop.—12 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from extra Fertilizer over 1N.	
Sulphate of Ammonia. (N)	Super-phosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
90	240	120	13·3	14·4	2 6 0	..	..
180	240	120	14·1	14·1	2 17 0	10 0	..
270	240	120	16·3	14·2	3 7 0	3 1 0	..
360	240	120	19·8	14·4	3 18 0	7 11 0	..
450	240	120	20·7	14·4	4 8 0	8 4 0	..

DISCUSSION.

This trial site was selected after the cane had ratooned, and five series of plots were treated to increasing applications of sulphate of ammonia.

The yields were rather disappointing, in spite of the care which the farmer devoted to the crop. However, the indications of nitrogen deficiency are very clear, and substantial gains were recorded even up to the heaviest application of 450 lb. sulphate of ammonia per acre.

MACKAY DISTRICT.

Two of the plant crop trials of 1937 were continued to the first ratoons, and the results of these are recorded at this time. Though one of these was virtually a crop failure, the second provides results of considerable interest, and confirms the opinion which has frequently been expressed in reference to the soils of the district. Many years of cropping without adequate regard to the maintenance of their plantfood reserves has reduced them to a state of rather low fertility, which can only be overcome by the consistent use of heavy fertilizer dressings, combined with the practice of green manuring with leguminous crops when the land is in fallow. Better still for many of the soils would be a long spell under grass, followed by green manuring before the land is again planted to cane.

It is pleasing to note the increased interest which farmers of the district are exhibiting towards the use of lime. Many of the soils are notably acid and in need of lime; but there are others which are still quite well supplied with this material, and any farmer contemplating the use of lime on his land should first have soil samples tested to determine whether they require treatment, and in which quantities.

Rosier & Simpson's Farm, Homebush Road, Mackay.

Soil Type.—Fine sandy forest loam.

Nature of Crop.—First Ratoon.

Variety.—Q. 813.

Age of Crop.—14 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	11·9	16·8	..	..	..
250	300	..	16·4	16·7	2 13 0	5 10 0	..
250	..	150	18·4	16·9	2 17 0	9 4 0	..
..	300	150	14·0	16.7	1 18 0	2 1 0	..
250	300	150	20·5	16·4	3 11 0	10 10 0	..

DISCUSSION.

Both crops harvested from this site have demonstrated the general lack of available plantfoods in the soil. These are illustrated by recording the relative responses to the individual plantfood materials employed:—

Crop Increase Due to—	Plant Cane.	First Ratoon.
	Tons.	Tons.
Sulphate of ammonia	5·3	6·5
Superphosphate	3·0	2·1
Muriate of potash	3·6	4·1

The outstanding deficiencies are in respect to potash and nitrogen. The first step in any programme designed to restore the fertility of this soil is obviously to incorporate green manuring in the rotation, so as to help build up the nitrogen supply. When the cane is planted, a substantial application of Sugar Bureau No. 2 Planting mixture should be applied with the plants. Ratoons will also require a similar application of No. 2 Ratooning mixture and top dressings of sulphate of ammonia so as to supply at least 2 bags per acre.

R. F. Jarrott's Farm, Branscombe, Mackay.

Soil Type.—Alluvial loam. **Nature of Crop.**—First Ratoon.

Variety.—Q. 813. **Age of Crop.**—10 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Super-phosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	6·7	14·4	..	..	..
250	300	..	9·0	14·4	2 13 0	0 18 0	..
250	..	150	8·2	14·4	2 17 0	..	0 9 0
..	300	150	7·4	14·3	1 18 0	..	0 14 0
250	300	150	9·6	14·2	3 11 0	0 8 0	..

DISCUSSION.

The crop on this site had rather an unfortunate ratoon history, and as will be judged from the yield data, the yields were low from all treatments.

It will be recalled that the plant crop yields from this area were also lower than might reasonably be expected, and one is forced to conclude that this area is probably in need of a long fallow under green manure crops to restore it to a better state of fertility. It would appear rather significant that the variety grown was Q. 813, which is notable for its reaction to root parasites under unfavourable conditions. The use of a stronger rooting variety is also to be recommended when the land is replanted.

SOUTHERN DISTRICTS.

Some nine fertility trials were harvested in the Southern districts during 1939. Six of these are reported in the pages which follow immediately, while a further three represent a new departure in experimental method, and these are dealt with in detail towards the end of this section.

It is of interest to observe the pronounced benefits which follow the use of suitable fertilizers on the older lands of the southern areas, now that growers have access to suitable cane varieties. A few years ago, when the areas were in the throes of gumming disease, and the varieties propagated did not possess the vigour of growth and disease resistance shown by the newer canes, fertility trial results were generally disappointing; but the average yields for the six "standard type" trials recorded here as as follows:—

	Tons.
Average "Fully manured" plots	38·7
Average "No manure" plots	30·0
Average gain due to fertilizer	8·7

It must be stressed that the soils of Southern Queensland exhibit a wide range of variability insofar as their plantfood requirements are concerned. Farmers should therefore pay special attention to the soil type on which each trial was conducted, and be guided only by those results from lands similar to their own. Manures which produce favourable results on red volcanic loams may be quite unsuitable on red forest soils, and *vice versa*.

C. M. Jensen's Farm, South Kolan, Bundaberg.

Soil Type.—Brown volcanic loam (shotty).

Variety.—Co. 290.

Nature of Crop.—Standover Second Ratoon.

Age of Crop.—22 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	32·4	13·3	..	..	..
360	240	..	40·9	12·6	3 0 0	2 10 0	..
360	..	180	46·2	12·6	3 11 0	7 11 0	..
..	240	180	35·5	12·9	1 17 0	..	0 9 0
360	240	180	49·1	12·8	4 2 0	11 10 0	..

DISCUSSION.

Three crops have now been harvested from this trial, and it is of interest to tabulate the relative crop increases obtained from the individual plantfood materials employed:—

Crop Increase due to—	Plant Cane.	First Ratoons.	Second Ratoons.
	Tons.	Tons.	Tons.
Sulphate of ammonia	2·2	8·7	13·6
Superphosphate	1·9	2·7	2·9
Muriate of potash	1·5	3·3	8·2

These figures show several very striking features:—(1) The land was capable of producing a fair plant crop; (2) both potash and nitrogen deficiencies were evident with the first ratoon crop; (3) the second ratoon crop (harvested when two years old) showed an accentuation of this condition, although the phosphate supply remained reasonably good; (4) the influence of a vigorous variety such as that grown (Co. 290), on the plantfood reserves of the soil, must be kept in mind in devising a suitable fertilizer programme.

On this area of volcanic soil, it is obvious that the potash-rich Sugar Bureau No. 3 mixtures are required. These should be applied at the rate of 4-5 cwt. per acre for all crops, followed by sulphate of ammonia top dressings, especially on ratoons.

F. Read's Farm, off Barolin Road, Bundaberg.

Soil Type.—Red sandy loam. **Nature of Crop.**—Second Ratoon.
Variety.—P.O.J. 213. **Age of Crop.**—12 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	7·9	13·3	..	..	..
300	360	..	13·8	13·4	2 18 0	5 4 0	..
300	..	180	18·3	14·0	3 4 0	12 4 0	..
..	360	180	10·6	14·0	2 3 0	2 12 0	..
300	360	180	20·9	13·8	4 0 0	14 2 0	..

DISCUSSION.

This trial has yielded consistently interesting results for the three crops which have been harvested. The following were the relative crop increases due to the individual plantfood materials employed:—

Crop Increase due to—	Plant Cane.	First Ratoons.	Second Ratoons.
	Tons.	Tons.	Tons.
Sulphate of ammonia ..	1·3	2·6	10·3
Superphosphate	0·4	0·8	2·6
Muriate of potash	1·8	2·4	2·6

Once again we find a consistent though rather small gain in yield for both phosphate and potash, and the gains are greatest with the older ratoon crop; but the most spectacular crop increase has been effected by the application of sulphate of ammonia. The effect with the plant crop—and even the first ratoons—was not great; but the second ratoon crop showed a gain of over 10 tons of cane due to a top dressing of 300 lb. of sulphate of ammonia.

This particular land requires applications of Sugar Bureau No. 2 mixtures, though sandy loams of this series generally need No. 1

fertilizers. Top dressings of sulphate of ammonia will be of especial value on ratoons, though a moderate application should also be made to plant cane, where green manuring is not practised.

W. Loeskow's Farm, Gooburrum, Bundaberg.

Soil Type.—Red sandy loam.

Variety.—P.O.J. 234.

Nature of Crop.—Standover Second Ratoon.

Age of Crop.—22 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S. in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	19·4	13·4	..	..	..
300	325	..	22·5	13·5	2 17 0	1 4 0	..
300	..	130	22·9	13·2	2 18 0	11 0	..
..	325	130	24·1	13·5	1 15 0	4 4 0	..
300	325	130	27·4	13·3	3 13 0	5 9 0	..

DISCUSSION.

The first ratoon crop from this trial was harvested when one year old, in 1936. It yielded about 25 tons of cane per acre, and showed definite responses to the fertilizers applied, notably to superphosphate. The second ratoons were stood over, and in the yields recorded above it will be seen that striking gains have been obtained from both the mixed manure applied and from the sulphate of ammonia top dressings.

Probably Sugar Bureau No. 2 mixtures would be best suited to this soil type, though No. 1 mixtures are usually quite satisfactory. The use of sulphate of ammonia in the form of top dressing will also be most important, especially for ratoons, and this material should be of greatest value with standover ratoon crops; such cane could be given a light application just prior to the second growth season, if it were possible to apply it.

T. H. Chappell's Farm, South Isis, Childers.

Soil Type.—Red volcanic loam. **Nature of Crop.**—Plant Cane.
Variety.—P.O.J. 2878. **Age of Crop.**—18 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	47·3	15·2	..	..	..
180	240	..	50·5	15·1	2 0 0	1 16 0	..
180	..	300	51·7	14·9	3 6 0	1 4 0	..
..	240	300	51·9	15·2	2 12 0	4 2 0	..
180	240	300	53·6	15·0	3 17 0	3 7 0	..

DISCUSSION.

The returns recorded for the plant crop of this trial show what may be expected of variety P.O.J. 2878, given reasonably favourable moisture conditions with red volcanic loams. In such a year also, any soil deficiencies are made evident, and the following gains were obtained for each of the three plantfood materials employed:—

Crop Increase Due to—	Cane per Acre.
	Tons.
Sulphate of ammonia	1·7
Superphosphate	1·9
Muriate of potash	3·1

As might be expected, the highest gain was obtained for potash, and this substantiates the standard recommendation of Sugar Bureau No. 3 mixtures for red volcanic loams.

Though top dressings of sulphate of ammonia may not be highly necessary for plant cane, ratoons should not be neglected in this regard, especially where these are harvested as two-year-old cane. In these circumstances it is an advantage to make a light top dressing of sulphate of ammonia just prior to the second growth season, if the condition of the crop makes this practicable.

J. H. Brand's Farm, Huxley, Childers.

Soil Type.—Red volcanic loam.

Nature of Crop.—Standover First Ratoon.

Variety.—P.O.J. 2878.

Age of Crop.—24 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from extra Fertilizer over P.	
Sulphate of Ammonia. (N)	Super-phosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	250	..	31·6	12·7	0 16 0	..	..
200	250	200	33·5	12·6	3 7 0	..	0 19 0
200	250	400	34·4	13·0	4 12 0	0 18 0	..
400	250	200	32·5	12·4	4 9 0	..	4 3 0
400	250	400	35·5	12·4	5 13 0	..	2 6 0

DISCUSSION.

The autumn plant crop was harvested from this area in 1937; little if any benefit was recorded for any of three plantfood materials used. The standover first ratoon crop returns, tabulated above, show no outstanding gains for heavy fertilizer applications, though a potash deficiency is indicated. This is customary with red volcanic loams.

The consistent use of light applications of Sugar Bureau No. 3 fertilizer mixtures could be used to advantage on all soils of this type. Nitrogen deficiencies are usually not marked, with red volcanic loams, but the above results suggest that sulphate of ammonia might be used to moderate advantage on standover ratoon crops.

H. H. and A. G. Owen's Farm, Paynter's Creek, Nambour.

Soil Type.—Alluvial sandy loam.

Variety.—Co. 290.

Nature of Crop.—Plant Cane.

Age of Crop.—14 months.

RESULTS.

Fertilizer Applied per Acre.			Crop Yields.		Cost of Fertilizer and Application.	Net Return (per acre) from Fertilizer.	
Sulphate of Ammonia. (N)	Superphosphate. (P)	Muriate of Potash. (K)	Cane per Acre.	C.C.S in Cane.		Profit.	Loss.
Lb.	Lb.	Lb.	Tons.	Per cent.	£ s. d.	£ s. d.	£ s. d.
..	..	..	41·5	13·2	..	..	..
240	300	..	45·0	13·1	2 10 0	15 0	..
240	..	120	44·0	13·6	2 11 0	3 1 0	..
..	300	120	41·0	13·4	1 13 0	..	1 1 0
240	300	120	45·8	13·5	3 4 0	3 17 0	..

DISCUSSION.

The Moreton Mill area experienced a particularly favourable growing season for the 1938 crop. Under the conditions which obtained, variety Co. 290 gave consistently good yields, and the results tabulated above are no exception. Though it is not a high C.C.S. cane, the results were also generally satisfactory.

An obvious experience where larger crops are harvested is that the soil will require heavier applications of fertilizer to maintain the fertility of the land. The results recorded at this time show that sulphate of ammonia was responsible for the main crop increases. In general, beneficial results will follow the consistent use of Sugar Bureau No. 1 mixtures on soils of this class, followed by top dressings of sulphate of ammonia, especially for ratoons. Normally 3-5 cwt. of mixture per acre will be found satisfactory; 1½ bags of sulphate of ammonia per acre for plant cane, and 2 bags for ratoons should complete a well-balanced fertilizer treatment.

Miscellaneous Fertility Trials.

FARM FERTILITY TRIALS EMPLOYING A MODIFIED EXPERIMENTAL PLAN.

Each year, in presenting the results of farm fertility trials, the general uniformity of experimental plan employed has been explained. This consisted usually of 25 small plots, 5 of which were devoted to each of 5 experimental treatments, so that the yield results presented represented the average of the yields of 5 similar plots.

A modified technique which has lately been developed in England, involves 27 small plots instead of the customary 25, but it enables the experimenter to derive from the results much more valuable information regarding soil plantfood deficiencies than was possible with the earlier layout. Briefly, one each of the 27 plots is devoted to each of the 27 possible combinations of the following:—

No nitrogen
"Single" nitrogen
"Double" nitrogen } with { No phosphate
"Single" phosphate
"Double" phosphate } with { No potash
"Single" potash
"Double" potash

"Single" might represent 150 lb. per acre of the particular plantfood material, in which case the "double" dressing would be 300 lb. It is thus seen that the information obtained is *quantitative* in character, in that one obtains evidence not only of the plantfood deficiency, but of the application per acre which will probably be found most economical. Moreover, the estimated yield for each plantfood treatment is obtained by taking an average of the yields from 9 individual plots, and the results are as a consequence much more accurate and reliable.

At the same time, the difficulty in setting out the results for presentation in simple form is increased, and it is necessary to modify the method of tabulation of yields as employed earlier in this series of Bulletins. As the chief points of interest are the yield increases due to increasing applications of the three individual plant-foods (nitrogen, phosphoric acid, and potash), regarding each as though the other two were absent, these figures alone will be given. It is hoped that this will not lead to confusion; if there should be any doubt as to the true significance of the actual figures given, the discussion appended to each series of results should serve to indicate the main conclusions to be drawn from the figures.

B. Anderson's Farm, Elliott Road, Bundaberg.

Soil Type.—Red sandy loam.
Variety.—P.O.J. 2878.
Nature of Crop.—Plant Cane.
Age of Crop.—19 months.

YIELDS.

Fertilizer applied per Acre.	Crop Yields.		Net return per acre from each Plantfood Material.
	Cane per Acre.	C.C.S. in Cane.	
	Tons.	Per cent.	£ s. d.
No sulphate of ammonia (N)	29·4	13·4	..
160 lb. sulphate of ammonia	30·7	12·6	3 1 0 Loss
320 lb. sulphate of ammonia	33·6	13·1	**2 4 0 Gain**
No superphosphate (P)	24·6	12·8	..
160 lb. superphosphate	32·8	12·9	**9 3 0 Gain**
320 lb. superphosphate	36·3	13·4	**15 7 0 Gain**
No muriate of potash (K)	32·0	12·9	..
120 lb. muriate of potash	30·6	12·9	2 5 0 Loss
240 lb. muriate of potash	31·1	13·0	1 19 0 Loss

DISCUSSION.

The outstanding benefits were recorded from the applications of superphosphate; while the *single* application was responsible for a gain of 8·2 tons of cane per acre, further 3·5 tons increase resulted from the application of extra 160 lb.

Obviously a mixture rich in phosphate is required on this land; and consistent with our usual findings, Sugar Bureau No. 1 mixtures will supply the necessary plantfood balance for this forest sandy loam. On the results obtained at least 5 cwt. of the mixture should be applied per acre to all crops. The definite gain from sulphate of ammonia also stresses the humus deficiencies of the soil type, urging the adoption of green manuring as a standard practice, with moderate applications of sulphate of ammonia for all ratoons, especially if these are allowed to stand over.

E. H. Rehbein's Farm, Duncraggan Road, Bundaberg.

Soil Type.—Red volcanic loam. **Nature of Crop.**—Plant Cane.
Variety.—P.O.J. 213. **Age of Crop.**—14 months.

YIELDS.

Fertilizer applied per Acre.	Crop Yields.		Net return per acre from each Plantfood Material.
	Cane per Acre.	C.C.S. in Cane.	
	Tons.	Per cent.	£ s. d.
No sulphate of ammonia (N)	35·3	14·8	..
150 lb. sulphate of ammonia	36·0	14·3	2 11 0 Loss
300 lb. sulphate of ammonia	34·8	14·5	3 19 0 Loss
No superphosphate (P)	35·9	14·5	..
120 lb. superphosphate	35·1	14·4	1 18 0 Loss
240 lb. superphosphate	35.2	14·5	1 9 0 Loss
No muriate of potash (K)	34·5	14·3	..
150 lb. muriate of potash	35·1	14·1	1 6 0 Loss
300 lb. muriate of potash	36·4	14·7	**2 16 0 Gain**

DISCUSSION.

Though this area of red volcanic loam has yielded a very satisfactory one-year-old crop of P.O.J. 213, little gain has been obtained from any fertilizer treatment. But there is definite evidence of the customary potash deficiency which these soils normally exhibit, and Sugar Bureau No. 3 mixtures are recommended as most suitable for this soil type.

It will be of interest to await the results of the first ratoons, to determine whether plantfood deficiencies will be accentuated.

Messrs. Wendland and Sons' Farm, Bidwell, Maryborough.

Soil Type.—Red loam ("shotty").
Variety.—M. 1900 Seedling.
Nature of Crop.—Plant Cane.
Age of Crop.—15 months.

YIELDS.

Fertilizer applied per Acre.	Crop Yields.		Net return per acre from each Plantfood Material.
	Cane per Acre.	C.C.S. in Cane.	
	Tons.	Per cent.	£ s. d.
No sulphate of ammonia (N)	27·2	15·2	..
150 lb. sulphate of ammonia	26·1	14·9	3 12 0 Loss
300 lb. sulphate of ammonia	26·2	15·2	3 1 0 Loss
No superphosphate (P)	26·4	14·7	..
180 lb. superphosphate	26·6	15·2	**2 0 0 Gain**
360 lb. superphosphate	26·5	15·3	**1 17 0 Gain**
No muriate of potash (K)	26·4	14·8	..
120 lb. muriate of potash	27·2	15·2	**2 1 0 Gain**
240 lb. muriate of potash	25·9	15·3	0 2 0 Loss

DISCUSSION.

Quite a number of supplies were required in this trial, due to a patchy initial strike. The resulting stools remained weak throughout, leading to a degree of irregularity in plot yields which could not be related to fertilizer treatment. No comment will be offered at this time, but we hope that the ratoon yields will be more informative.

MAGNESIUM SULPHATE EXPERIMENTS.

Recent commercialisation of magnesian limestones (or dolomites) has directed attention to the possibility of magnesia deficiencies in the Queensland cane soils. With a view to examining this problem, a number of field trials were set out in several of the major cane areas of the State. In no case was any definite positive evidence observed from applications of this plantfood, when applied in the form of magnesium sulphate, at the rate of 200 lb. per acre.

For seven of these trials, actual plot yields were determined accurately, and the results of these are summarised below:—

Farmer.	Soil Type.	Magnesia Plots.		Check Plots.	
		Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
		Tons.	Per cent.	Tons.	Per cent.
Provera and Co., Meringa	Grey schist ..	18·8	17·4	17·4	16·9
Rasmussen Bros., Harvey Creek	Gravelly loam	17·7	16·3	16·8	16·6
F. J E. Holt, The Cedars, Mackay	Sandy loam ..	19·7	17·2	22·5	17·2
C. McGown, Dumbleton, Mackay	Old alluvial sandy loam	24·3	17·8	23·7	17·8
Young and Young, Walkerston, Mackay	Forest sandy loam	29·9	15·8	32·2	15·5
H. E. Iwers, Rosella Mackay	Forest sandy loam	27·0	18·4	26·8	18·4
E. H. Atherton, Cliftonville, via Sarina	Forest sandy loam	26·4	17·0	28·8	16·6
Average, all trials ..	..	**23·4**	**17·1**	**24·0**	**17·0**

In no trial was any significant influence on yield experienced. From these results it may be concluded that magnesia deficiencies are not general in Queensland cane soils, though the possibility of isolated examples of such deficiency are by no means excluded. Doubtless many of the benefits following applications of magnesian limestones are attributable to the effect of these materials in neutralizing soil acidity; in such cases, ordinary high-grade agricultural limestone would produce similar results.

MOLASSES TRIAL.

H. Keiser's Farm, Sandhill's Road, Bundaberg.

Soil Type.—Red volcanic loam. **Nature of Crop.**—First Ratoon.

YIELDS.

Treatment.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
A. No treatment	16·1	16·1
B. 10 tons molasses per acre	22·7	15·9
C. 5 tons molasses + fertilizer equivalent to 5 tons molasses per acre	**24·9**	**16·3**
D. Fertilizer equivalent of 10 tons molasses per acre	22·9	16·0

DISCUSSION.

From time to time the high value of molasses as a fertilizer has been emphasised. This is notably true in the case of the potash-deficient red volcanic soils, as molasses is particularly rich in this plantfood. But it has also been shown that, on the dry red volcanic soils of Bundaberg, such weak-rooting varieties as Q. 813 often give disappointing ratoon yields even when liberally fertilized; and that this influence can be overcome equally well by steam-sterilizing the soil or by treating it with molasses.

The experiment discussed at this time represents an attempt to demonstrate this virtue of molasses which must be attributed not to its plantfood content, but to the benefits conferred upon the soil apparently during the process of decomposition of the sugars and other organic matters which it contains.

The results presented above demonstrate this effect very clearly. While 10 tons of molasses or the plantfood equivalent of this application produced equal increases in yield (over 6½ tons cane per acre), the treatment which combined molasses and fertilizer was even more highly beneficial. These results may be interpreted as follows:—The plantfood applied as molasses (notably the nitrogen) is not so readily available for plant nutrition as that given in the form of water-soluble artificial manures; hence molasses alone brings with it the beneficial "soil sterilizing" influence which the artificial manures do not, but the immediate plantfood value of the latter is the greater. Apparently these effects exactly compensated in this experiment, and the yields from the two treatments (B and D) were identical. But when the advantages of the soluble fertilizer were combined with the added beneficial influences of the molasses (C), the crop yield increased by further 2 tons of cane per acre.

An attempt has been made to repeat this experiment on a field of ratoons on another farm. At the time of presenting this report the ratoon field on Mr. Keiser's farm is carrying Poona pea, and the residual effects of the previous molasses treatments are sharply defined in the legume crop.

FILTER MUD TRIAL.

A. H. Reichardt's Farm, Silkwood.

Soil Type.—Acid alluvial loam. **Nature of Crop.**—First Ratoon.

YIELDS.

Treatment.	Cane per Acre.
	Tons.
15 tons filter mud per acre	19·6
No treatment	19·2

DISCUSSION.

Filter muds are in great demand amongst farmers in many cane areas. By virtue of their substantial lime and phosphate content, as well as their richness in organic matter, they have long been recognised as excellent materials for rejuvenating old cane lands. The experiment reported above arose from a discussion regarding the manner in which they might be applied for best results. Instead of applying the muds to fallow land, they were spread broadcast at the rate of 15 tons per acre on a block of Badila ratoons, and cultivated into the land. No further plantfood treatment was given to either mud or check plots.

At no stage in the growth of the crop could benefits from the mud treatment be detected. It must not be concluded that the material was worthless, but the results demonstrate clearly that greatest profit will probably result if the muds are spread on fallow land and allowed to decompose before the cane is planted.

Varietal Trials.

NORTHERN DISTRICTS.

In the Quarterly Bulletin for October, 1938, the yield results of a number of varietal trials were presented and discussed. Two of these trials represented the ratoon crops from plots which had been set out in the field in 1936, while one plant crop trial embraced three gum-resistant varieties in comparison with Badila as standard. The remainder represented plant crops of the new seedlings—Q. 4, Q. 10, and Q. 12, with an appropriate standard variety.

Before the close of the 1938 harvest, further six trials with these seedlings were harvested, in addition to ratoon crops from earlier plantings, and a further plant trial including the gum-resistant canes Korpi, P.O.J. 2725 and P.O.J. 2878. The individual results of these trials are presented below, and there follows a review of all varietal trial returns obtained during 1937.

Messrs. Vessey and Son's Farm, Edge Hill, Cairns.

Soil Type.—Schist loam (outwash).

Nature of Crop.—Plant Cane.

Age of Crop.—17 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
S.J. 4	34·3	16·7
Q. 4	39·3	15·7
Q. 10	31·1	17·6
Q. 12	32·3	15·9

DISCUSSION.

The plants germinated well, but unfavourable growing conditions gave the crop a set-back during the early summer months. Further late summer growth checks reacted adversely on the crop, but the yields were very satisfactory in the circumstances.

Q. 4 easily outyielded the other canes of the trial, but showed a lodging tendency; Q. 12 was badly lodged and tangled at the time of harvest; S.J. 4 and Q. 10 stood erect.

Q. 10 gave the highest C.C.S., being almost a unit in advance of the standard, S.J. 4; Q. 4 and Q. 12 were distinctly inferior in this respect, being almost 2 units below Q. 10.

P. S. Simmonds' Farm, Wright's Creek, Edmonton.

Soil Type.—Schist alluvial loam.

Nature of Crop.—Second Ratoon.

Age of Crop.—12 months.

YIELDS.

Variety.	Plant Crop.		First Ratoon.		Second Ratoon.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
Badila	35·7	14·1	20·2	**16·9**	15·4	17·1
Q. 2	**44·3**	**16·3**	**28·3**	16·8	**18·7**	**18·3**

DISCUSSION.

Both varieties ratooned reasonably well, but received repeated growth checks due to dry weather. The drought conditions accentuated soil variability factors, and the individual plot yields showed substantial variations due to this cause.

The crop was poor as a consequence of the unfavourable season; again Q. 2 outyielded Badila, while the C.C.S. of the former was 1·2 units in advance of the standard variety.

Q. 2 has shown to particular advantage on this land throughout the three crops which have been harvested. It is not suggested, however, that Q. 2 is a superior variety to Badila; for special circumstances demanding a hard-rinded cane, Q. 2 has a particular value, while it is also of assistance on flooded country.

E. Sues' Farm, Gordonvale.

Soil Type.—Old alluvial loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—16 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
S.J. 4	**26·3**	17·0
Q. 4	26·0	14·8
Q. 10	23·0	**17·2**
Q. 12	24·0	15·6

DISCUSSION.

All varieties germinated satisfactorily and few supplies were necessary; but in common with all crops in the far north during the past season, repeated growth checks reacted adversely on yields, and the values recorded are very satisfactory in the circumstances.

The standard S.J. 4 slightly outyielded Q. 4; while Q. 10 gave the lowest yield, it excelled in respect of sugar content, but Q. 4 and Q. 12 were substantially inferior to Q. 10 and the standard in this regard.

In none of the plots was the yield sufficiently great to cause lodging, but Q. 12 showed a tendency to settle down, where the crop was heaviest.

Messrs. E. M. and C. H. Bennett's Farm, Aloomba.

Soil Type.—Old alluvial loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—16 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Badila	23·0	16·7
Korpi	26·6	17·0
P.O.J. 2878	28·8	15·7
P.O.J. 2725	30·2	15·0

DISCUSSION.

Due to the outbreak of gumming disease in this area, it is essential that growers have access to alternative resistant varieties, to replace the susceptible S.J. 4 and Clark's Seedling; it is contended that the land is not rich enough for Badila.

The yields of this trial demonstrate the superior yielding quality of the P.O.J. canes, while Korpi also outyielded Badila in this particular season. Korpi yielded the highest C.C.S. in cane, while P.O.J. 2725 was definitely inferior in this regard.

Top rot was responsible for a considerable amount of dead sticks with certain varieties: P.O.J. 2878 was the most seriously affected, followed by Badila, P.O.J. 2725 in that order, while Korpi was scarcely affected.

In the above returns, Korpi showed distinct promise; but the ratooning qualities of this variety are not always satisfactory, particularly if the cane is cut early in the season. The 1939 ratoon results should therefore provide interesting information.

The yields recorded in this trial should be studied in conjunction with those for Messrs. Gadaloff Bros.' trial (October, 1938 Bulletin, p. 63).

Estate of C. Ryan, Daradgee, Innisfail.

Soil Type.—Red loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—14 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Badila	28·1	15·4
Q. 4	**32·8**	13·8
Q. 10	30·0	**16·1**
Q. 12	31·2	14·8

DISCUSSION.

Conditions at planting time were very favourable, but Q. 10 and Q. 12 require heavy supplying. Dry weather of early summer reacted unfavourably, but thereafter growing conditions were generally satisfactory.

The varietal yields show but slight variation, and the most interesting feature of the trial is the high sugar content of Q. 10, despite the fact that this cane had fallen badly some months before it was harvested. Q. 4 and Q. 12 were likewise lodged and tangled, and the C.C.S. results are not satisfactory.

Messrs. Prete and Colombano's Farm, Mundoo, Innisfail.

Soil Type.—Old alluvial loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—11 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Pompey	21·0	11·5
Q. 4	**21·7**	11·1
Q. 10	17·0	**15·3**
Q. 12	19·2	12·2

DISCUSSION.

Q. 10 and Q. 12 gave poor strikes, despite soil conditions favourable for germination. Following a dry spell until the end of November, generally favourable growing conditions were experienced; but the cane never recovered fully from the check caused by the dry spell, and yields were low as a consequence.

Though the cane was harvested in July, Q. 10 gave a very favourable C.C.S. content, indicating the early maturing characteristics of the variety. It was very definitely ahead of all other varieties in this respect, and when due allowance is made for the poor strike obtained, it may be considered as at least equal, if not superior, to the other varieties in the trial.

Messrs. McRobbie and Son's Farm, Mundoo, Innisfail.

Soil Type.—Old alluvial loam. **Nature of Crop.**—First Ratoon.
Age of Crop.—13 months.

YIELDS.

Variety.	Plant Cane.		First Ratoon.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
Q. 1	19·7	**15·7**	8·7	**15·0**
Q. 2	22·1	15·3	13·4	14·7
Q. 12	24·7	15·6	12·9	13·4
Pompey	29·0	12·8	**18·4**	12·3
Q. 4	**29·6**	14·1	16·1	12·6

DISCUSSION.

Growing conditions for the ratoons were generally favourable, but owing to the poor stand, the crop was very uneven. Pompey gave the highest cane yield, though in C.C.S. content it was again inferior to all other varieties.

This trial has proved disappointing in all particulars, and no conclusions may be drawn from the results obtained; Q. 1, Q. 4, and Q. 12 have now been discarded as unsatisfactory canes.

D. Beccaris' Farm, Mourilyan.

Soil Type.—Reddish brown schist loam.

Nature of Crop.—Plant Cane.

Age of Crop.—13 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
S.J. 4	25·2	14·5
Q. 4	**27·6**	13·0
Q. 10	26·3	**16·4**
Q. 12	26·7	15·3

DISCUSSION.

Germinations were very satisfactory in this trial, and despite dry conditions during late autumn, crop growth was reasonably good throughout. All plots of Q. 12 were badly lodged at time of harvest, while certain of the Q. 10 plots had also commenced to fall.

There was little difference in the yield of cane for all varieties, but again Q. 10 demonstrated its high C.C.S. content, being considerably superior to all other varieties in this respect. It must therefore be regarded as the best cane under the conditions of the trial.

G. G. Barnett's Farm, Euramo, Tully.

Soil Type.—Black forest loam.

Nature of Crop.—Plant Cane.

Age of Crop.—16 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Badila	33·5	**17·1**
Q. 4	**43·0**	14·0
Q. 10	31·9	15·3
Q. 12	32·8	15·3

DISCUSSION.

The initial strike was not satisfactory, and many supplies were required; all struck well, with the exception of Q. 10, and the stand in the plots of this variety was patchy.

The canes made good growth throughout the season; Q. 4 gave easily the highest cane yield, with the remaining varieties about equal. Badila showed the highest C.C.S. content when the crop was harvested; all Q. varieties were badly lodged and some cane had rotted.

It would appear that this land is entirely suitable for Badila, as other varieties grow too rankly, lodge, and rot.

GENERAL DISCUSSION AND CONCLUSIONS.

The varieties of particular interest at this time are the seedlings Q. 4, Q. 10 and Q. 12, raised by the Bureau in North Queensland in recent years. Fourteen yield trial results are now available on which to gauge the merit of these canes; although the crops were produced and harvested mainly in one season, they cover a wide range of soil types, though generally second-class land only was selected for the purpose of these experiments.

The following general conclusions on the behaviour of these seedlings are offered tentatively:—

Q. 4.—This cane has given some excellent cane tonnages; but on account of its open character of growth, its extreme brittleness, and low C.C.S. content, it has been discarded.

Q. 10.—In the fourteen trials recorded (*see* Quarterly Bulletin for October, 1938 also), this variety outyielded the standard cane 5 times, was equal in yield once, and inferior 8 times. In respect of sugar content, it was particularly favorable; on 9 occasions it was superior to the standard, and was inferior 5 times.

The average yield and C.C.S. values were:—

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Q. 10	26·8	15·2
Standard	27·9	14·7

The variety is resistant to gumming disease in North Queensland, while its hard rind allows it to withstand borer attack much better than do Badila and Clark's Seedling. It shows distinct early-maturing tendencies, which are a definite asset. In view of its promise, the cane has been placed in propagation trials in each of the Northern mill areas, and it will probably be more widely planted in experimental plots during the spring of 1939.

Q. 12.—This variety has displayed great vigour of growth; but due to its extreme lodging tendencies and low sugar content, it has been discarded.

Of the remaining varieties reported on, **Q. 2** has become an approved variety in most northern districts, where it finds definite application as a variety for flooded country, and areas where the incidence of borers is extreme.

P.O.J. 2878 and **Korpi** are seen to possess value for the gum-infested lands south of Gordonvale, and they give promise of becoming useful stop-gap canes. The P.O.J. varieties should be particularly useful on these older alluvial soils, by virtue of their strong ratooning qualities and drought resistance; Korpi does not always give a satisfactory ratoon crop.

MACKAY DISTRICT.

P.O.J. 213 v. Co. 290.

The variety P.O.J. 213 was introduced to the Mackay district some years ago, and it has found considerable favour with many farmers on the poorer classes of soil. In view of the vigorous growth displayed by Co. 290 under similar conditions, and having regard for the susceptibility of P.O.J. 213 to mosaic and downy mildew diseases, to which Co. 290 is resistant, four trials were set out during 1937 to determine the comparative yielding qualities of the two canes.

The results of these trials are given in the following pages:—

J. J. Hand's Farm, Wundaru, Farleigh.

Soil Type.—Forest clay loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—15 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 213	24·5	**16·2**
Co. 290	**28·5**	16·1

DISCUSSION.

A moderate stand was obtained, and both canes made favourable early growth, despite dry conditions. Both varieties stooled well, but Co. 290 produced taller and thicker stalks; and while P.O.J. 213 was slightly lodged when harvested, Co. 290 remained erect.

Co. 290 proved superior to the P.O.J. cane in tonnage per acre while the C.C.S. values were practically equal, when harvested in November.

J. Trevaskis's Farm, Farleigh.

Soil Type.—Forest sandy loam. **Nature of Crop.**—Plant Cane.
Age of Crop.—15 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 213	23·6	**15·5**
Co. 290	**32·0**	15·3

DISCUSSION.

Both canes gave fair strikes, and the crops made good progress during the dry spring months. Although P.O.J. 213 stooled rather better than Co. 290, the latter provided the thicker and longer stalk. When harvested in November, the C.C.S. of P.O.J. 213 was but slightly superior to that of Co. 290.

Messrs. Bezzini Bros. & Zammit's Farm, Eimeo Road, Mackay.

Soil Type.—Sandy loam (with stones).

Nature of Crop.—Plant Cane.

Age of Crop.—15 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 213	22·5	**16·9**
Co. 290	**31·4**	16·7

DISCUSSION.

Although conditions were dry until the end of 1937, both canes struck fairly well, and made fair early growth. They covered in rapidly. Both canes stooled well, but Co. 290 produced longer and thicker, erect stalks. The sugar content of both canes was very satisfactory, with P.O.J. 213 slightly superior when the canes were harvested in late October.

E. N. Iwers' Farm, Cliftonville, via Sarina.

Soil Type.—Forest sandy loam.

Nature of Crop.—Plant Cane.

Age of Crop.—14 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 213	29·6	**17·3**
Co. 290	**32·7**	16·1

DISCUSSION.

The strike was fair, and both canes were retarded in early growth by dry conditions which persisted until the end of the year. Both varieties gave good coverage, stooled well, and grew rapidly when conditions became favourable. Again Co. 290 produced the longer and thick stalks. In this trial the P.O.J. variety was definitely superior in sugar content; the crop was harvested in November.

GENERAL DISCUSSION AND CONCLUSIONS.

In the farm trials reported, variety Co. 290 exhibited a general superiority in yield of cane per acre, while there was little to choose in respect of C.C.S. The average values were:—

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 213	25·1	**16·5**
Co. 290	**31·2**	16·1

In view of the more favourable characteristics exhibited by Co. 290, this variety will be approved for plantings in 1939, while P.O.J. 213 will be eliminated. It should be emphasised that Co. 290 generally yields the best C.C.S. values when harvested late in the season; and when grown under very wet conditions it may give a prolific cane tonnage, with low sugar content.

SOUTHERN DISTRICTS.

Although only one new varietal trial was initiated during 1937, the results from the ratoons of two earlier trials are also available and are reported below.

Windermere Plantation, Bundaberg.

Soil Type.—Red volcanic soil. **Nature of Crop.**—Plant Cane.
Age of Crop.—19 months.

YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 2878	**33·8**	**17·2**
P.O.J. 2883	30·9	16·2

DISCUSSION.

The Java "Wonder Cane," P.O.J. 2878, has demonstrated its superior qualities in this trial. It outyielded P.O.J. 2883 by 3 tons per acre, and was a unit higher in sugar content.

P.O.J. 2883 was somewhat handicapped by a poorer stand of cane, while the stooling was not so prolific as for the "Wonder Cane." The former variety gives an excellent stick and should prove a very valuable standover cane; as pointed out earlier, this variety will be kept in reserve, due to the existence of Fiji and downy mildew diseases in P.O.J. 2878.

Windermere Plantation, Bundaberg.

Soil Type.—Red volcanic loam. **Nature of Crop.**—Third Ratoons.
Age of Crop.—12 months.

YIELDS.

Variety.	Plant Crop.		First Ratoon.		Second Ratoon.		Third Ratoon.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
D. 1135	19·7	12·9	12·4	12·4	7·0	13·4	16·8	15·3
P.O.J. 2940	23·9	**16·2**	7·9	14·2	7·3	**13·8**	14·9	**16·5**
P.O.J. 36	27·4	14·4	15·1	**15·1**	8·9	13·2	18·2	15·3
P.O.J. 2883	29·1	15·1	**20·9**	13·8	10·0	..	21·6	15·3
Co. 290	**33·1**	15·5	20·1	13·6	**11·3**	13·4	**28·1**	15·2

DISCUSSION.

Four crops have now been harvested from this block, and the yields for the new gum-resistant varieties show the undisputed superiority of these over the old standard, D. 1135.

Co. 290 has performed uniformly well in respect of yield of cane per acre, while it has given a very satisfactory C.C.S. throughout. P.O.J. 2940 has given sweet juices each year, but cane tonnages have been disappointing. P.O.J. 2883 would have been more widely planted in the area, but further propagation has been checked since the outbreak of Fiji and downy mildew diseases.

H. A. Ilett's Farm, Apple Tree Creek, Childers.

Soil Type.—Red volcanic loam. **Nature of Crop.**—Standover First Ratoon.

Age of Crop.—24 months.

YIELDS.

Variety.	Plant Crop.		First Ratoon.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
P.O.J. 2883	33·0	15·4	44·6	14·6
B. 417	36·3	**15·5**	36·1	**15·4**
P.O.J. 2725	36·6	15·0	51·2	*
P.O.J. 2940	40·6	15·4	51·2	14·8
P.O.J. 2878	**43·5**	14·9	**57·6**	14·6

* No test taken—adjacent cane of same age gave C.C.S. of 15·0 per cent.

DISCUSSION.

P.O.J. 2878 demonstrated its outstanding qualities in both plant and ratoon crops. Both were harvested when two years old, and the "Wonder Cane" produced a total crop of just over 100 tons of cane per acre. Although B. 417 (a Barbados variety) gave the highest C.C.S. with both crops, it was distinctly inferior in cane yield. P.O.J. 2725 and P.O.J. 2940 yielded well in both plant crop and ratoons, while in each case the C.C.S. was superior to that of P.O.J. 2878.

These results lend further support to the conclusion that P.O.J. 2878 is the most valuable cane at present grown in the Isis area, and growers cannot be too strongly urged to guard it against the inroads of Fiji disease which now menaces the district.

DAVID WHYTE, Government Printer, Brisbane.